SPECIFICATION AMENDMENTS:

Please replace paragraphs [0015], [0017] – [0019], [0021], [0023], [0026], [0027], [0031], [0038] – [0044], [0047], [0048], [0051] – [0054], [0075] – [0077] and [0080] with the following rewritten paragraphs:

[0015] Figure 1 is a schematic view showing ~~an example~~ one embodiment of ~~the~~ a polishing apparatus according to the present invention.

[0017] Figure 3 is a part of another ~~example~~ embodiment of ~~the~~ a polishing apparatus according to the present invention.

[0018] Figure 4 is a part of another ~~example~~ embodiment of ~~the~~ a polishing apparatus according to the present invention.

[0019] Figure 5 is a schematic view showing another ~~example~~ embodiment of ~~the~~ a polishing apparatus according to the present invention.

[0021] Figure 7 is a block diagram showing ~~an example~~ one embodiment of a control circuit of ~~the~~ a polishing apparatus according to the present invention.

[0023] Figure 9 is a schematic view showing another ~~example~~ embodiment of ~~the~~ a polishing apparatus according to the present invention.

[0026] Figure 12 is a flow chart showing an example of a manufacturing process, that includes the polishing apparatus and method described herein, used in the manufacture of ~~the~~ a magnetic disk.

[0027] Further details are explained below with the help of examples illustrated in the attached drawings. Figure 1 is a schematic view showing ~~an example~~ a first embodiment of ~~the~~ a polishing apparatus according to the present invention. Figure 2 is a part of the polishing apparatus shown in Figure 1. The polishing apparatus of this example comprises a magnetic disk rotating unit, abrasive tapes 3, tape supply units, tape heads 5, tape head pressuring units, tape

take-up units and a VCM (Voice Coil Motor) drive circuit 90. The magnetic disk rotating unit has a motor 21 and a spindle 22. The tape head pressuring units have a swing arm 61, a voice coil motor 62, an arm 63 and a bearing 65. The tape supply units have a supply reel 4 and guide rollers. The tape take-up units have guide rollers and a take-up reel 7.

[0031] The arms 63 are connected to movable portions 62a of the voice coil motors 62. The arms 63 are supported movably by the bearings 65, and ~~. And~~ ends of the arms 63 contact the axes 5a of the tape heads 5. When the VCM drive circuit 90 supplies drive currents to the voice coil motors 62, the movable portions 62a move due to the electromagnetic force and the arms 63 push the tape heads 5, so that the tape heads 5 press the abrasive tapes 3 against the surfaces of the magnetic disk 2.

[0038] Figure 3 is a part of another ~~example~~ embodiment of the polishing apparatus according to the present invention. In this example, a feature different from the example shown in Figure 1 is that the tape head pressuring unit does not utilize the swing arm 61 but utilizes a linear-type voice coil motor 66 for supporting the tape head 5. Other elements are the same as those of the example shown in Figure 1. The axis 5a of the tape head 5 is directly connected to a movable portion 66a of the linear-type voice coil motors 66 whose movable portion 66a moves straight. The tape head 5 moves in the direction indicated by an arrow D when the linear-type voice coil motor 66 is driven.

[0039] According to this ~~example~~ embodiment, since the tape head 5 is connected to the movable portion 66a of the linear-type voice coil motor 66, the swing arm and the like is unnecessary, so that the structure becomes simple.

[0040] Figure 4 is a part of another ~~example~~ embodiment of the polishing apparatus according to the present invention. In this example, a feature different from the ~~example~~ embodiment shown in Figure 1 is that the tape head pressuring unit does not utilize the swing arm 61 but utilizes a rotary-type voice coil motor 67 for supporting the tape head 5. Other elements are the same as those of the ~~example~~ embodiment shown in Figure 1. The axis 5a of the tape head 5 is directly connected to a movable portion 67a of the rotary-type voice coil motors 67 whose movable portion 67a rotates. The tape head 5 moves in the direction indicated by an arrow E when the rotary-type voice coil motor 67 is driven.

[0041] According to this ~~example~~ embodiment, since the tape head 5 is connected to the movable portion 67a of the rotary-type voice coil motor 67, the swing arm and the like is unnecessary, so that the structure becomes simple, and the equipment becomes small comparing with the equipment utilizing the linear-type voice coil motor.

[0042] Figure 5 is a schematic view showing another ~~example~~ embodiment of the polishing apparatus according to the present invention. In this ~~example~~ embodiment, a feature different from the ~~example~~ embodiment shown in Figure 1 is that the tape supply units, which have the supply reel 4 and the guide rollers, and the tape take-up units, which have the guide rollers and the take-up reel 7, are located below a rotation axis of the magnetic disc 2.

[0043] The polish wastes ~~are adhering~~ adhere to the abrasive tapes 3 after polish. ~~When~~ If the abrasive tapes 3 ~~will be~~ are recovered above the magnetic disk 2, the polish wastes removed from the abrasive tapes 3 will float in the air near the surfaces to be polished. However, according ~~According~~ to this ~~example~~ embodiment, since the abrasive tapes 3 are recovered below the magnetic disk 2 by the recovery reels 7, it becomes possible to prevent the flotation of the polish wastes removed from the abrasive tapes 3 in the air near the surfaces to be polished. Although both the tape supply units and the tape take-up units are located below the magnetic disk 2 in this example, the tape supply units may be located above the magnetic disk 2 and only the tape take-up units may be located below the magnetic disk 2.

[0044] In the polishing apparatuses according to the ~~examples~~ embodiments explained above, it is required to rotate the magnetic disk 2 at high speed in order to improve the throughput. However, when a high-speed rotation of the magnetic disk 2 will be carried out to some extent, the voice coil motors will resonate to vibrations caused by many factors, such as deflections of the surfaces of the magnetic disk 2, etc., and mechanical vibrations will occur in the voice coil motors. Once the mechanical vibrations occur in the voice coil motors, the pressures, with which the tape heads 5 press the abrasive tapes 3 against the surfaces of the magnetic disk 2, will fluctuate.

[0047] According to this ~~example~~ embodiment, the oscillation energy of the voice coil motor 62 can be consumed as the heat, and the mechanical vibration can be attenuated. Therefore, it becomes possible to stabilize the pressure, with which the tape head 5 presses the abrasive tape 3

against the surface of the magnetic disk 2, and to polish the magnetic disk 2 while rotating it at high speed.

[0048] Figure 7 is a block diagram showing an ~~example~~ embodiment of a control circuit of the polishing apparatus according to the present invention. In this example, a current sensor 81, which measures a current in the voice coil motor 62, is further provided to the example shown in Figure 1, and a control circuit 91, which controls the voice coil motor 62, is provided instead of the VCM drive circuit.

[0051] According to this ~~example~~ embodiment, it becomes possible to attenuate the mechanical vibration of the voice coil motor 62 by detecting the vibration of the voice coil motor 62 and feeding them back to the electric signal 101 that causes the pressuring force. Therefore, it becomes possible to stabilize the pressure, with which the tape head 5 presses the abrasive tape 3 against the surface of the magnetic disk 2, and to polish the magnetic disk 2 while rotating it at high speed. Moreover, comparing with the example shown in Figure 6, the attenuation effect of the mechanical vibration can be improved by adjusting the gain G2 of the adjustment circuit 95 or the like.

[0052] Figure 8 is a block diagram showing another ~~example~~ embodiment of the control circuit of the polishing apparatus according to the present invention. In this example, a feature different from the example shown in Figure 7 is that a control circuit 92 has a high frequency signal generator 96. A high frequency signal generated by the high frequency signal generator 96 is added to the output of the setting circuit 93, so that a high frequency signal is included in the electric signal 101 supplied to the voice coil motor 62 from the drive amplifier 94.

[0053] According to this ~~example~~ embodiment, since the high frequency signal is included in the electric signal 101, the pressuring force generated by the voice coil motor 62 includes a high frequency element, and the pressure, with which the tape head 5 presses the abrasive tape 3 against the surface of the magnetic disk 2, changes at high frequency, so that the polish performance improves.

[0054] Figure 9 is a schematic view showing another ~~example~~ embodiment of the polishing apparatus according to the present invention. The polishing apparatus of this ~~example~~ embodiment comprises a magnetic disk rotating unit, abrasive tapes 3, tape supply units, tape

heads 5, tape head pressuring units, tape take-up units, load cells 64, linear displacement sensors 66 and a control circuit 110. The magnetic disk rotating unit, which has a motor and a spindle, is not seen just like Figure 1. The tape head pressuring units have a swing arm 61, a voice coil motor 62, an arm 63 and a bearing 65. The tape supply units have a supply reel 4 and guide rollers. The tape take-up units have guide rollers and a take-up reel 7. Operations of the magnetic disk rotating unit, the abrasive tapes 3, the tape supply units, the tape heads 5, the tape head pressuring units and the tape take-up units are the same as those of the ~~example~~ embodiment shown in Figure 1.

[0075] According to this ~~example~~ embodiment, since the voice coil motor 62 is driven by generating the target load signal and controlled by feeding the load detection signal from the load cell 64 back to the target load signal, even if the surface of the magnetic disk 2 deflects, the pressuring force of the voice coil motor 62 is finely adjusted in response to a deflection by the feedback control. Therefore, it becomes possible to polish the surface of the magnetic disk 2 uniformly.

[0076] Furthermore, according to this ~~example~~ embodiment, since the voice coil motor 62 is driven by generating the target load signal, which rises gradually up to the final target load, depending on the load detection signal from the load cell 64 and controlled by generating the target load signal indicating the final target load after that, it becomes possible to prevent the damage generated when the abrasive tape 3 touches the surface of the magnetic disk 2.

[0077] Furthermore, according to this ~~example~~ embodiment, since the tape head 5 is once stopped at the point, which is close to the surface of the magnetic disk 2, and the contact of the abrasive tape and the magnetic disk is carried out softly, it becomes possible to prevent the damage generated when the abrasive tape 3 touches the surface of the magnetic disk 2.

[0080] Figure 12 is a flow chart showing an example of a manufacturing process, including the polishing apparatus and methods described herein, to manufacture a ~~of the~~ magnetic disk. First, a polishing process is carried out on both surfaces of a substrate, which consists of an aluminum alloy, etc., and its surfaces are mirror-polished so as to have the surface roughness of about 1 nanometer in average (Step 210). Next, undercoating layers with non-magnetic metal, which

consist of a nickel-phosphorus (Ni-P) alloy, etc. and whose thickness is about 5-20 micrometers, are formed on the surfaces of the substrate by electroless plating, etc. (Step 220). Then, a mirror-polishing process is carried out and upper layers are polished out about 2-5 micrometers so as to have the surface roughness Ra of about 20-50 angstroms (Step 230). Next, after carrying out a texturing process for making minute grooves (Step 240), undercoating layers with metal, which consist of chromium, copper, NiAl, etc. and whose thickness is about 50-2000 angstroms, are formed by sputtering, etc. (Step 250). Then, magnetic layers, which consist of a ferromagnetic cobalt alloy, etc. and whose thickness is about 100-1000 angstroms, are formed by sputtering, etc. (Step 260). Then, protective films, which consist of a carbon film, a carbon hydride film, a carbon nitride film, etc. and whose thickness is about 10-150 angstroms, are formed (Step 270). After forming the protective films in such a manufacturing process, in order to remove small protrusions generated during these membrane forming processes and in order to clean up the surfaces of the magnetic disk, the tape cleaning is carried out on the surfaces of the magnetic disk (Step 280).